

RECONNAISSANCE STUDY
Section 905(b) (WRDA 86) Analysis
Master Plan for Grand River at Lansing, Michigan
10 August 2004

1. STUDY AUTHORITY:

a) A House resolution specifically for the Lansing Master Plan was adopted on May 22, 2002. This authority reads as follows:

“Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That, the Secretary of the Army, is requested to review the report of the Chief of Engineers on the Grand River at Lansing, Michigan, published in Senate Document 132, 84th Congress, 2nd Session, and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable, with particular reference to preparing a master plan to identify and develop measures for flood control, shoreline protection, environmental restoration and protection, recreation and associated purposes at and in the vicinity of Lansing, Michigan.”

b) Funds in the amount of \$ 100,000 were appropriated by Congress in Fiscal Year 2003 to conduct the reconnaissance phase of the study.

2. STUDY PURPOSE:

The purpose of this study is to determine if there is a Federal (Corps) interest to identify and develop measures for flood control, shoreline protection, environmental restoration and protection, recreation, and associated purposes at and in the vicinity of Lansing, Michigan on the Grand River. In response to the authority, the reconnaissance study was initiated in April 2003. The reconnaissance study has resulted in the finding that there is a Federal interest in continuing development of a Master Plan to identify and develop measures for flood control, shoreline protection, environmental restoration and protection, and recreation. The scope of future Master Plan work has been established and its cost estimated.

3) LOCATION OF STUDY, NON-FEDERAL SPONSOR AND CONGRESSIONAL DISTRICTS:

a) Study Area: The study area includes an 8 mile corridor along the Grand River in the City of Lansing, Michigan. The City of Lansing is the capital of Michigan and is located in the central, southern portion of the Lower Peninsula within Clinton, Eaton, and Ingham Counties. Lansing is located in the upper portion of the river basin where the Grand River changes direction from northward to westward.

The Grand River is Michigan's longest river, winding 250 miles from Jackson to Lake Michigan. The Red Cedar River, one of seven major tributaries, enters the Grand River in the City of Lansing, just south of I-496. The Grand River Watershed is the largest watershed in the State of Michigan. The watershed has been divided into two parts, the Lower Grand River Watershed and the Upper Grand River Watershed. The City of Lansing is located within the Upper Grand River Watershed.

b) Non-Federal Sponsor: City of Lansing, Michigan

c) Congressional District: 8th Congressional District, Congressman Mike Rogers (R)

U.S. Senator's Carl Levin and Debbie Stabenow

4. PRIOR REPORTS AND EXISTING PROJECTS:

a) There are no existing Corps of Engineers projects within the study area at Lansing, Michigan.

b) The following reports are being reviewed as a part of this study.

Central Lansing Comprehensive Plan: A Revitalization Strategy for Lansing's City Center. August 1999.

The Riverfront is addressed in Section V, Central Lansing Planning District Recommendations. Several recommendations are proposed for the riverfront including: the expansion of the existing river trail and park on both sides of the river; providing more bicycle and pedestrian bridges over the Grand River; providing physical and visual linkages to the river; and the careful planning of new waterfront development to prevent damage by flooding.

River Island Area Comprehensive Plan 1990. October, 1978.

Several policies and recommendations concerning the Grand River are proposed in this study and are found in the Environment and Land Use portion of the Policies, Assets, Problems, and Strategies chapter. Such policies include identifying and preserving environmentally sensitive natural features, protecting and improving the banks of the Grand River, and protecting and improving water quality. One specific recommendation for the Grand River is to enhance river views through tree planting, landscaping, and providing public access to the riverfront.

Southwest Area Comprehensive Plan 1990. July 1980.

This study serves as the official land use and development plan for the Southwest Area of the City of Lansing. The Policies, Assets, Problems and Strategies section of the plan provides numerous recommendations regarding rivers and waterfront development. One community facility policy introduced in the study is to pursue the preservation, acquisition and/or control and development of the waterfront. Protecting and improving the Grand River and its banks is a stated policy for the natural environment. Specific environmental strategies recommended in the plan include: supporting plans for the continuation of Riverfront Park along the Grand River by placing land along the river into public ownership; and protecting the water quality of the Grand River by making improvements to the City's sewer system and treatment facility.

Southeast Area Comprehensive Plan 1990.

This comprehensive plan covers the Southeast Area of the City of Lansing. The Policies, Assets, Problems and Strategies section of the plan provides numerous recommendations regarding river and waterfront development. One community facility policy introduced in the study is to pursue the preservation, acquisition and/or control and development of the waterfront. Protecting and improving the Grand River, Red Cedar River, Sycamore Creek and riverbank areas is a stated policy for the natural environment. Some of the specific environmental strategies proposed include: support plans for developing the Red Cedar hiking/bike path; protecting water quality of rivers through upgrades to the City's sewer system and treatment facility.

North-East Area Comprehensive Plan 1990. June 1984.

This Comprehensive Plan covers the northeast area of Lansing, the southern boundary of which is formed by the Grand and Red Cedar Rivers. Specific recommendations concerning the area's rivers are introduced in the Policies, Assets, Problems, and Strategies component of the Plan. One recommendation is to develop waterfront areas, through site acquisition and easements, for public recreational use (fishing, boating, etc.). It is also a stated goal of the Comprehensive Plan to improve the water quality of the area lakes and rivers to increase their use for recreational purposes.

Phase I Environmental Site Assessment, 307 East Kalamazoo Street. (Triangle Property) May 8, 2001

The purpose of this study was to provide an environmental assessment of city owned property located along the Grand River. Based on the initial results, further subsurface investigations at the site were recommended.

Phase II Environmental Site Assessment, 307 East Kalamazoo Street. (Triangle Property) August 30, 2001.

This site assessment is a follow up of the Phase I assessment of the site. The primary object of the assessment was to evaluate the recognized environmental conditions identified in the Phase I report. Indicated site is a facility. Recommended a BEA (baseline environmental assessment) be completed for the subject site.

Phase I Environmental Site Assessment, Lansing Board of Water and Light Ottawa Station, 209 East Ottawa Street/312 North Grand Avenue. May 25, 2001.

The purpose of this study was to provide an environmental assessment of the 6-acre Lansing Board of Water and Light property, the east side of which is bordered by the Grand River. Recommended further subsurface investigations at the subject property.

Phase II Environmental Site Assessment 312 North Grand Avenue. October 11, 2001.

This site assessment is a follow up of the Phase I assessment of the 6-acre Lansing Board of Water and Light property. The primary objective of the assessment was to evaluate the recognized environmental conditions identified in the Phase I report. Indicated site is a facility. Recommended a BEA (baseline environmental assessment) be completed on behalf of any future owner/operators of the subject property.

Plan for Development of Lansing's Waterfront. February, 1974.

This study focused on providing strategies and recommendations for the future development of waterfront lands in Lansing. In the study's Policy Plan, goals, policies and actions were suggested for each of the following categories: natural features, land use, transportation, economic issues, social issues, health issues, and governing bodies. A Schematic Waterfront Plan Map was also prepared illustrating the study's recommendations.

Willow-Pine Area Development Plan. September 1, 1992.

This study focused on the future development of the Willow-Pine Area, the northern and eastern side of which is bordered by the Grand River. One of the environmental strategies proposed in the study is to enhance attractive views through tree planting, landscaping and maintenance, and by providing public access to the riverfront. It was also identified that one environmental problem in the area is the degradation of water quality in the Grand River, leading to unpleasant odors, especially during periods of low flow.

Cherry Hill Area Development Plan. May, 1985.

The Cherry Hill neighborhood is located southeast of Downtown along the Grand River. The study first profiles the existing conditions in the area, and then provides “proposals for development” concerning housing, community facilities, public services, circulation and land use. Several of the community facility proposals include conducting improvements to the lands located alongside the Grand River such as cleaning the river banks to provide views to the river.

Regional Drainage Management Preliminary Report. March, 1972.

This report studies drainage management for the counties of Clinton, Eaton, and Ingham. Coordination of local drainage systems based on regional plans and policies is a major focus of the study. Included in the study are policy plans and standards for drainage systems, a preliminary drainage system plan and improvement program, and implementation strategies.

Welcome to the Lansing River Trail Brochure.

This brochure shows a map of the Lansing River Trail along with descriptions of landmarks and other significant sites along the trail route.

Downtown Lansing, From Downtown to Old Town Lansing, Unique Like You. May 2003. Brochure.

This brochure provides a map of downtown with descriptions of businesses, services, and other attractions.

Capitalize on Downtown Lansing, Revitalization Incentives. Economic Development Corporation of the City of Lansing. Brochure.

This brochure describes the various programs offered by the City Economic Development Corporation including the Façade Improvement & Loft Housing Construction Program, Business Financing Assistance Program, and Downtown Neighborhood Enterprise Zones.

City of Lansing, Michigan, Information Technology Initiative. Connected to Your Future. Brochure.

This brochure provides a description of Lansing’s E-Conomic Development Project. Goals of the project include making internet access available to citizens, making Lansing government technology friendly, and promoting the benefits of information technology.

Michigan’s Lansing Region. Hometown Communities, Advanced Opportunities.

This report, prepared by the Lansing Regional Chamber of Commerce, highlights the competitive advantages of the Lansing Region’s business climate.

Our Neighborhoods, Our Families, Our Future. 2002.

This report provides a description of the numerous City departments and bodies charged with the responsibilities of protecting and promoting the City's neighborhoods, families, and future.

Lansing, Michigan. The Engine that Powers Success! An Economic Resource Guide. 2002.

This report provides a general profile of the Lansing Region. The report includes facts on the region, economic development resources, economic development projects, workforce, attractions, health care, transportation and utilities.

City of Lansing Parks and Recreation Master Plan 2000-2005. March 1, 2000.

Many of the projects included in the Action Plan and Capital Improvements Schedule relate to the City's rivers and riverfront lands. In General, the City Parks and Recreation Department continues to seek opportunities for acquisition of riverfront lands for recreation purposes. Some of the riverside parks with proposed improvements include Louis F. Adado Riverfront Park, Frances Park, and Grand River Park. Expansion of the River Trail, which runs along the Grand and Red Cedar Rivers, is proposed through additional site acquisitions and securing trail easements. In addition, the Action Plan recommends that the City should seek new opportunities to develop water based recreational activities, such as fishing, boating, and other water related sports and leisure activities.

NPDES Phase II Storm Water Permit Application: City of Lansing. September 2002.

Storm water discharge permit application to MDEQ identifies anticipated schedule, watershed planning approach, known point source discharges of storm water and drainage system boundaries, scope for illicit discharge elimination plan and scope for public education plan.

City of Lansing Combined Sewer Overflow Control Project Plan Draft. March 1991.

The recommended CSO Control Plan is for complete separation. The construction of the recommended alternative would be scheduled to occur over a period of approximately 30 years due to the size and expense of the project. The plan is prioritized based on mitigation of basement flooding problems, potential for total body contact in receiving waters, and improved operability of the system.

North Lansing Dam Safety Report. Lansing Board of Water & Light. Dec 23, 2003. Purpose was to evaluate the structural condition, stability, and hydraulic capacity of the dam. The report concludes that the dam is in very good condition with no apparent structural deficiencies that would lead to immediate failure of the dam. Recommended actions included: some repair of scour, concrete on the tops of piers, vegetation removal in retaining walls, minor cleaning and painting, reclassification of the dam to “Significant Potential Hazard”, monitor need for ice prevention around drum gates, and finally to consider removal of the dam because it is no longer required to support utility operations.

Limited Phase II Environmental Site Assessment Report: Sunset and Comfort Street Property. Lansing, MI. DLZ Michigan, Inc. October 2002.

The report concluded that based on the presence of hazardous substances exceeding Part 201 Generic Residential and Commercial Cleanup Criteria on Parcels B and D, both parcels are “facilities” as defined by Part 201, as amended. If the City of Lansing intended to proceed with a property transfer, it was recommended that a BEA (baseline environmental assessment) and Section 7a Compliance Analysis (Due Care Plan) be prepared prior to, or immediately after, acquisition or appropriate steps to provide liability protection for the City of Lansing.

5. PLAN FORMULATION:

a) Public Concerns: During preparation of this report 4 meetings were held with various City of Lansing Departments, the Lansing Board of Water and Light, and interested local stakeholders. The following public concerns were identified.

- Some riverfront areas have floodplain delineation issues and restrictions
- Exotic species are being identified in study area.
- Bank erosion and instability along some stretches of the river.
- Aesthetics of hardened (concrete) shoreline along the river in the downtown area.
- Limited pedestrian traffic on River Trail and connections to adjacent amenities (businesses, cultural, recreation, neighborhoods, etc.)
- Fishing in the area could be improved.
- Emergency access to/from River Trail is limited.
- River Trail signage and way finding is limited.
- Riverfront not utilized and enjoyed as it could be.
- Degraded water quality (Low Dissolved Oxygen and High Temperature) in some stretches of the river.
- Lack of canoeing/kayaking and motor boats on the Grand River.
- North Lansing Dam and Moore’s Park Dam impede fish passage and boat access.

b) Problems and Opportunities: Based on the concerns expressed at 4 meetings with various City of Lansing departments and interested stakeholders the following specific problems and opportunities were identified.

Problems:

- **Moore's Park**
 - Shoreline Erosion.
 - Impedes upstream fish passage for migratory and resident fish.
 - Boat access is limited.
 - Fishery impact from heated water (over 90-degrees), which drains into the upper embayment from the power plant operated by the Lansing Board of Water and Light.
 - Nearshore emergent and submergent aquatic habitat has been degraded
 - Fish kills have occurred at the Moore's Park Dam due to fish being pumped thru the adjacent power plant turbines.
- **Potter Park**
 - Shoreline Erosion (caused by pedestrians and geese).
 - Flooding.
 - Stormwater runoff from outside animal exhibits.
- **North Lansing Dam and Brenke Fish Ladder**
 - Fish passage by the resident fishery is impeded.
 - The Mill Race still exists near the North Lansing Dam, but is plugged.
 - Impeded fish movement of resident fish such as walleye, northern pike, small mouth bass, sucker, and catfish. Resident fish are not strong enough to move upstream of the Brenke Fish Passage structure at the North Lansing Dam. Brenke Fish Passage structure was built in 1981 for migratory fish.

- **Downtown Lansing**
 - Deteriorating Seawalls.
 - Lack of river connection to Downtown Businesses.
 - The planned Lansing Convention Center expansion on East Side of river could impact river edge habitat and use.
 - Ottawa Plant Adaptive Reuse (including coal storage area).
 - CSO Elimination at Wentworth Park.
 - Triangle Property Redevelopment.
 - Segments of River Trail pilings and foundations (sections on west side of river, south of Michigan Avenue) are closed right now due to unsafe conditions.
 - Some major utilities (particularly steam) are located and exposed along several segments of the seawall (GM and Wentworth Park).
 - Urban development and industrialization have led to the hardening of the Grand River in downtown Lansing for erosion protection and flood control purposes.
 - The stretch of river between the North Lansing Dam and Moore's Park Dam is relatively flat with low velocity and low aeration rates. Heated water from Moore's Park can impact oxygen levels, which can drop below the water quality standards (5mg/l).
 - Nearshore emergent and submergent aquatic habitat has been degraded.
- **General Bank Stabilization and Water Quality**
 - Fulton Park (west of Waverly Road in Eaton County) needs shoreline stabilization.
 - Grand River from its Lake Michigan confluence upstream to Jackson has a fish consumption advisory due to elevated levels of PCB's in fish tissue.
 - Low Dissolved Oxygen and High Water Temperature from Moore's Park Dam downstream to North Lansing Dam.
- **Urbandale Neighborhood Flooding**
 - Flooding and floodplain restrictions.

Opportunities:

- Improve fish passage, aquatic habitat, and water quality by removal of the North Lansing Dam.
- Greenway development could improve the quality of life in Lansing, Michigan by preserving and creating open spaces.
- Create and/or connect trails and greenways from the riverfront to Downtown Lansing to increase recreational and transportation opportunities and use of the riverfront, which could improve business and strengthen local economies.
- Improve air and water quality by restoring plant and aquatic habitat in place of hardened seawalls.
- Preserve cultural and historically valuable areas along the Grand River shoreline.
- Develop areas to serve as natural floodplains where soft engineering techniques can be utilized along the riverfront.
- Provide educational opportunities thru identification of local plant species along the greenway.

c) Planning Objectives:

During preparation of this report several meetings were held with the City of Lansing, Michigan Department of Natural Resources, Michigan Department of Environmental Quality, Lansing Board of Water and Light, and interested stakeholders. As a result of those meetings the following objectives were identified as important to the local community.

Economic Development

- Encourage redevelopment and rehabilitation projects along the Grand River.
- Improve mobility and quality of life in the 8-mile study area, particularly by increasing all modes of transportation: including pedestrian, bicycle and boat.
- Use the river as a focal point to encourage residential uses in the downtown that would support and facilitate the development of economically viable and diverse businesses and specifically the potential for implementation of projects considered in this report.

Natural Resource Protection, Restoration and Utilization

- Encourage and facilitate water quality improvements.
- Encourage and facilitate aesthetic improvements.
- Improve species diversity and quality.
- Continue implementation of infrastructure and utility improvements.
- Increase and enhance recreational activity and utilization of the Grand River.

d) Planning Constraints:

- 1) Compliance with local land use plans.
- 2) Coordination with a variety of public/private interests with differing interests.
- 3) Soil and/or Groundwater contamination may be present along some stretches of the river.
- 4) Moore's Park Dam is under a Federal Energy Regulatory Commission license to control water levels upstream. Water level elevations at the upper embayment are controlled and can only vary within approved limits.

e) Measures to Address Identified Planning Objectives:

The study area includes approximately 8 miles of the Grand River within the City of Lansing, Michigan. During the planning process various sites were identified as areas of concern to the local community for which alternatives were developed to address one or more of the planning objectives. For any project the No Action alternative must be considered in order to comply with the National Environmental Protection Act (NEPA). Therefore, a description of the Without Project Condition is provided in this section. In addition, this section includes a listing of locations within the study area for which issues and concerns have been expressed and for which measures to mitigate those concerns are proposed.

No Action. The Corps of Engineers is required to consider the option of "No Action" as one of the alternatives in order to comply with the requirements of the National Environmental Policy Act (NEPA). No Action assumes that no project would be implemented by the Federal Government or by local interests to achieve the planning objectives. No Action, which is synonymous with the Without Project Condition, forms the basis from which all other alternative plans are measured.

The City of Lansing has a Comprehensive Plan for Central Lansing that was completed in August 1999 and used as a working blueprint for future land use, traffic circulation, zoning, and community facilities decisions. It considers appropriate land use for the central area and considers regional factors beyond the study area. However, without more detailed analysis of individual projects, the community would not have a road map to encourage and guide specific redevelopment and rehabilitation projects. This could lead to random development without a central common theme that does not positively impact the local economy or meet the desired goals of the community to reconnect the river to upland businesses.

Without fish passage the upstream movement of migratory and residential fish would continue to be impeded by the Moore's Park Dam. Heated water (90 – 105 degrees F) being pumped from cooling towers at the Lansing Board of Water and Light power station into the upper embayment at Moore's Park will continue to negatively impact the fishery and habitat in this area. Hardened (concrete) edges for erosion control and bank stabilization along portions of the 1.5 mile river edge between the North Lansing Dam and Moore's Park Dam would continue to negatively impact shoreline and emergent and submergent aquatic habitat.

Without a project to construct navigation lock structures at Moore's Park Dam or remove the North Lansing Dam there will be no possibility for boat access to the downtown Lansing area. A priority goal of the City is to provide canoe/kayak and motor boat access the downtown Lansing riverfront.

Without a project to reduce flooding damage in the Urbandale neighborhood this area would continue to experience flood damage and flood plain restrictions on development.

Alternative Solutions

Based on the list of problems, issues and concerns, as well as the project objectives, a list of alternative solutions that may address the identified issues was developed.

Moore's Park

- Soft shoreline engineering.
- Designated pedestrian & fishing access.
- Open space management.
- Fish ladder to allow passage around Moore's Dam.
- Lock & Dam System to allow boat passage.

The City indicated that they have received a Michigan Department of Natural Resources Trust Fund grant for Moore's Park that will include fishing access, canoe/kayak drop-in, shoreline stabilization and plantings.

Potter Park

- Soft shoreline engineering.
- Goose deterrents i.e. plantings along shoreline, reduction of bluegrass, etc.
- Stormwater retention, detention, bioswales, etc.
- Stormwater treatment of outdoor animal exhibits.

North Lansing Dam and Brenke Fish Ladder

- Dam removal/modification to allow for unimpeded fish and boat passage, artificial rapids for increased habitat diversity, and improved water quality.

Downtown Lansing

Ottawa Plant Adaptive Reuse

- Shoreline stabilization/flood protection/seawall repair.
- Public access improvements.
- River Trail connection.
- Riparian habitat improvement.
- Fishing Access.

Wentworth Park CSO (in conjunction with elimination plan)

- Soft shoreline engineering.
- Public access improvements.
- River Trail connection.
- Riparian Habitat Improvement.
- Fishing Access.
- Naturalize Shoreline

Lansing Center Expansion

- Shoreline stabilization/flood protection.
- Public access improvements.
- River Trail connection.
- Riparian Habitat Improvement.
- Fishing Access.

FEMA Floodplain Restrictions

- Research potential for map updates based on hydraulic analysis and topographic survey.

The FEMA Map Modernization program was discussed. It is believed that Ingham County Drain Commission is to receive funding to map the floodplain. Updated calculations will be utilized to determine the floodplain boundary.

Triangle Property Redevelopment

- Floodplain restrictions-possible map amendment.
- Public access improvements to downtown.
- River Trail connection.
- Riparian Habitat Improvements.

Alternatives should be considered that will take into account possible security concerns of potential developers along the Grand River, while maintaining connectivity of the River Trail.

Increase Use of Grand River

- Develop signage and way finding system that incorporates parks, cultural destinations, businesses, education, emergency egress, etc.
- Future design of River Trail expansion should focus on connections to the adjacent areas.
- Potential for water taxi system to transport people around to various destinations along the river.

General Bank Stabilization and Water Quality

- Utilize soft shoreline engineering techniques.
- Conduct invasive species and declining tree survey.
- Establish stratified replanting program for banks and shoreline areas where appropriate.
- Continue implementation of CSO elimination plan
- Where appropriate, incorporate stormwater runoff reduction/treatment plans such as bioswales, retention areas, oil & grease separators, parking lot/street sweeping programs, etc.

Urbandale Neighborhood Flooding

- Structural or non-Structural flood damage reduction alternatives.

f) Conclusions from the Preliminary Screening:

Master Plan

The development of a detailed Master Plan along the Grand River will require extensive coordination with both public and private stakeholders and the local community. Additional study is needed to identify the local community desires and establish a central common theme for riverfront restoration and measures to address flood control, shoreline protection, environmental restoration and protection, recreation and associated purposes. Master Plan alternatives need to be formulated and developed to focus on project implementation.

Focus Areas

1. Moore's Dam Modification for Fish and Boat passage.
2. Potter Park Zoo Habitat and Water Quality Improvements.
3. Downtown Lansing Habitat and Water Quality Improvements.
4. North Lansing Dam Modification/Removal for Habitat, Fishery and Water Quality Improvements.
5. Urbandale Flood Protection and Floodplain Restrictions.
6. Environmental Infrastructure in Accordance with Long Term CSO Control.

1) Moore's Dam Modification for Fish and Boat Passage:

Problem

- Moore's Park Dam prohibits the upstream passage of migratory and resident fish.
- Erosion is occurring on the south shore.
- Boat access into and out of downtown Lansing is severely impeded.

Potential Solutions

- Soft shoreline engineering.
- Designated pedestrian and fishing access.
- Open space management.
- Fish passage.
- Lock and dam system.

Background Information

The Moore's Park Dam (FERC No. 10684) is located on the Grand River, adjacent to the Eckert electric generating facility. It is one of three dams owned and operated by the Lansing Board of Water and Light (LBWL). The dam consists of a powerhouse with two 540 kW horizontal Francis turbines, an overflow spillway, a regulated spillway with three, 20-foot wide tainter gates, and an earthen embankment. The dam produces power, however, power production is limited to 1-2 percent of the City's needs.

Moore's Park Impoundment Fishery

The MDNR Fisheries Division produced an assessment to fulfill the commitment of Fisheries Division under the Resource Enhancement Plan Article 405 for Moore's Park Dam. The fish community in the Moore's Park Impoundment was evaluated in May 1996. The surface acreage of the impoundment is listed at 310 acres. The uppermost boundary is the toe of the Dimondale Dam. The Moore's Park Dam provides cooling water for the electric power generating station and is operated at run-of-the-river mode. The Moore's Park Dam blocks upstream fish migration. A small spring and fall fishery for walleye, steelhead, and coho below the dam has developed over the years.

Fish habitat is generally considered marginal throughout the impoundment. Some submerged logs and fallen trees are available along the banks. However, water depths are generally very shallow beneath the fallen trees and are not providing an optimal source of fish cover. Aquatic vegetation is generally sparse throughout the impoundment. Areas of rock riprap line the banks along Moore's River Drive and provide some cover for immature fish but again water depths are generally very shallow in these areas making them less suitable for holding adult fish. A number of concrete seawalls, which provide no bank cover, are found throughout the impoundment. Channel morphology is described entirely as "run" with the exception of immediately below the Dimondale Dam where a short "riffle" area exists. Fisheries management efforts at Moore's Park Impoundment have focused upon warmwater or coolwater species. Semi-annual fish stockings of walleye and channel catfish have occurred since the early 1980's.

The 1996 assessment described the fish community as one typical of other impoundments in southern Michigan. Nineteen species of fish were collected and the sport fishery consisted primarily of black crappie, channel catfish, walleye, largemouth bass, and smallmouth bass. Significant numbers of carp and sucker species were also observed. Other gamefish collected with trapnets in lesser abundance included pumpkinseed sunfish, rock bass, yellow perch, brown and yellow bullhead, longnose gar, shorthead and golden redhorse and warmouth sunfish.

The channel catfish fishery appears to have achieved self-sustaining status and is considered in very good condition. The walleye fishery is expected to improve through increased stocking rates. The size structure and relative abundance of bluegill and pumpkinseed sunfish appear in somewhat poor condition. Bass growth rates appear to be adequate. Maintaining run-of-the-river mode at Moore's Park Dam may aid in improving the bass fisheries. However, there is concern that inadequate habitat is limiting bass productivity.

Concepts Reviewed With Stakeholders

The stakeholders expressed significant interest in modifying the existing dam and immediate surroundings to allow for fish passage, improved fishery habitat, erosion control, and boat access.

The stakeholders are interested in further evaluating the potential to modify the Moore's Park Dam to include a natural-like fish passage on the south side, within the park, as well as a lock system to allow for shallow bottom boat passage into and out of the downtown Lansing area. This may include a docking area and overlook plaza, pedestrian and maintenance access, as well as a small canoe/kayak launch. The City of Lansing was recently awarded funds to make shoreline improvements at Moore's Park including an upper and lower level canoe portage as well as access improvements and asphalt trail extensions.

The MDNR fishery assessment of the Moore's Park Impoundment concluded that without enhancement efforts, it is unlikely that the status of the fishery in Moore's Impoundment will change significantly from what it is other than anticipated improvement in the walleye fishery through stocking. The greatest fisheries enhancement to the Moore's Park Impoundment would be obtained through modification of the Dimondale Dam and the by-pass channel control structure into more natural "white-water" type structures. The Dimondale Dam is approximately 8 miles upstream of the Moore's Park Dam. These actions would greatly benefit the fishery by providing greater upstream fish passage and by enhancing a highly desirable riffle area in the river. Additional rock substrate would also provide optimal spawning habitat for several gamefish species. The modification of the Dimondale Dam into such a structure may also provide for passage of canoes and smaller craft. Valuable bank cover has been lost throughout the impoundment due to seawall construction. Providing rock rip rap at the toe of these seawalls, and extending it to the contour break would provide for greatly enhanced fish cover. The steel seawall adjacent to the Board of Water and Light power station and the steel seawall on the south bank immediately downstream of Waverly Road along Moore's River Drive may also be candidates for such enhancements. Additional rock riprap extending to the contour break is recommended by the MDNR for the area between Frances Park and Waverly Road Bridge.

Outstanding Issues

The Moore's Park Dam is primarily used for maintaining a pond for discharge of heated water from the LBWL cooling water tower and the control of the upstream water level. Modifications to the dam are likely to be complicated, if permitted at all, because it is under a Federal Energy Regulatory Commission (FERC) license requirement to maintain water levels upstream to the Dimondale Dam. The MDNR and FERC also have an agreement with the LBWL to pay into a fund intended to enhance the Moore's Park area to compensate for fish kills related to higher water temperature and low dissolved oxygen resulting from the discharge of heated water from the power plant cooling towers. This funding is currently being used to design and plan the removal of the Dimondale Dam.

In addition, the MDNR has concerns regarding the heated water (90-105 degrees F) from the power plant cooling towers that is pumped into the upstream impoundment then over the dam. Elevated water temperatures may be lethal to cold water "migratory" fish and possibly resident warm-water fish that would use a proposed fish ladder. The MDNR stocks the river in this area and the Moore's Park Dam traps "migratory" fish from going upstream. The MDNR may not support a migratory fish passage at Moore's Park, but would support warmwater resident fish passage. The MDNR has also indicated that little natural reproduction occurs from salmonids in the Grand River, therefore a migratory fish ladder would provide little benefit "ecologically" but could have recreational benefits from fishing. The MDNR has expressed some interest in creating a ladder that would pass resident warm-water fish such as walleye, smallmouth bass, and northern pike while having a control structure that would allow limited fish passage of salmonids at certain times of the year when they are trying to travel upstream.

The resident fish are common both up and downstream. It may not be necessary to provide passage to allow access to habitat to fulfill life history requirements for species that are already established above and below the dams.

The Corps of Engineers has a mission with respect to navigation to provide safe, reliable, and efficient waterborne transportation systems (channels, harbors, and waterways) for movement of commerce, national security needs, and recreation. Construction of a navigation facility such as a lock structure at the Moore's Park Dam would be used for recreational boats along the Grand River. A lock system used for recreational purposes would not likely pass a benefit-cost analysis. Typically lock structures are constructed for commercial navigation, which derive National Economic Benefits.

Project Benefits

Most urban streams and river suffer effects such as increased sediment lands, decreased baseflow, higher flood flows, channel instability, and blockages that preclude fish migration. Urban fish passage is necessary to reopen and/or create habitat for fish migration as well as allow for resident fish mobility. Increasing the quantity and quality of spawning habitat typically increases the size of fishery for commercial/sport fishing, food, and attracting other wildlife. Fish passage projects increase habitat available for fish spawning and growth. The design philosophy for a nature-like fishway should be ecologically minded and try to achieve a good fit with the surrounding environment. Natural fish passage provide unimpeded movement for migratory and resident fish, restores some ecosystem function, improves habitat for plants, macro-invertebrates and animals, and it can potentially allow the passage of small boats, therefore, eliminating the need for portage. Restoring the shorelines to a more natural condition will provide valuable cover for adult fish as well as substrate for a number of macro-invertebrates.

Preliminary Reconnaissance Cost Estimates

Table 2: Preliminary Construction Cost Estimates	
Construction Task	Construction Cost
Nature-like Fish Passageway	\$60,000
Shoreline Stabilization	\$5,000
Lock & Dam System	\$5,000,000
CONSTRUCTION SUBTOTAL	\$5,065,000
Contingency (15%)	\$759,750
ESTIMATED CONSTRUCTION COST	\$5,824,750

2) Potter Park Zoo Habitat and Water Quality Improvements:

Problems

- Erosion caused by pedestrians and geese.
- Stormwater Runoff.
- Flooding in Potter Park.

Potential Solutions

- Naturalize river shoreline.
- Stormwater retention, detention, bioswales.
- Goose deterrents i.e. plantings along the shoreline, reduction of bluegrass, etc.
- The National Resource Conservation Service (NRCS) has been in contact with the Zoo Director in regard to a potential “soft engineering” project at Potter Park.

Background Information

The history of the Potter Park Zoo begins in 1915, when J. W. and Sarah Potter donated 58 acres of land to Lansing that became Potter Park. Twenty-seven more acres were added in 1917, and in 1920 the first animals, elk from Moore's Park, were transferred to Potter Park. Today, the majority of animal exhibits are outdoors with hard-packed ground from continuous animal and visitor traffic. The exhibit areas are cleaned on a daily basis, however, when rain events occur, and there is overland sheet flow, it is believed that some amount of animal feces runoff occurs and discharges into the Red Cedar River. There is regulatory disagreement about whether the runoff can be directed to the sanitary or the storm water system, if either. The Lansing Department of Public Works has requested the Zoo to not use the sanitary sewer system for animal waste removal and the MDEQ has requested the Zoo to not use the storm sewers. The Zoo is in non-compliance. The number of Canadian Geese at the Zoo is also a constant and enormous problem. It is believed these issues cause habitat degradation and water quality impairments for the Red Cedar River, which meets the Grand River a short distance to the east.

Concepts Reviewed With Stakeholders

The stakeholders expressed interest in looking for solutions and treatment methods for the stormwater runoff prior to discharge into the Red Cedar River. Existing collection and diversion methods are not satisfactory to regulatory agencies and are not aesthetically pleasing.

The stakeholders are interested in further evaluating the potential to provide extended treatment of stormwater runoff to improve habitat and water quality of the Red Cedar and Grand Rivers. It is also envisioned that treatment areas can be incorporated with existing exhibits as well as provide additional environmental education exhibits and aquatic community exhibits. The stormwater would be collected at a point at the north, near the railroad tracks. A sediment sump or pretreatment manhole would be located at the beginning of the “treatment train”. Flow would progress through a series of vegetated freshwater marsh communities prior to discharge into the existing lagoon. A weir control structure would be placed at the south end of the lagoon prior to discharge into the Red Cedar River. It is envisioned that the extended treatment and settling time prior to discharge will greatly improve water quality of the receiving waters.

The existing treatment lagoon at the Zoo is 50 to 70 years old and has never been dredged. The Zoo is divided into three sections for interior drainage. The Zoo Director would like assistance in solving the drainage and runoff issues on the east side, however, he has expressed interest in any assistance or ideas for drainage improvement at the entire site.

Outstanding Issues

Under its existing authorities, the Corps of Engineers cannot participate in a local service facility construction for municipal stormwater and sanitary treatment.

Project Benefits

Potential benefits would include improved water quality through extended treatment and settling time, filtering through increased emerged and submerged vegetation, and control structures. If a project design can be approved by the Zoo, MDEQ, and the City of Lansing, then a regulatory quandary will be resolved that has existed at the Zoo in terms of where the collected stormwater runoff is permitted to be discharged. The implementation of this project would not only provide for habitat improvements in terms of water quality but also in terms of additional acreage of habitat within an established riparian corridor. The project would also serve as a water quality and habitat improvement demonstration and education area for zoo visitors.

Preliminary Reconnaissance Cost Estimates

Table 3: Preliminary Construction Cost Estimates	
Construction Task	Construction Cost
Sediment Sump / Control Structure	\$25,000
Freshwater Marsh	\$35,000
Control Structure	\$5,000
Intermittent Stream Community	\$20,000
Overlook	\$7,500
<i>CONSTRUCTION SUBTOTAL</i>	<i>\$92,500</i>
Contingency (15%)	\$13,875
TOTAL ESTIMATED CONSTRUCTION COST	\$106,375

3) Downtown Lansing Habitat and Water Quality Improvements:

Problems

- Seawall condition.
- River Trail connections.
- Habitat and fishery improvements.
- Water quality improvements.
- Flood protection.

Potential Solutions

- Soft engineering shoreline stabilization.
- Flood protection measures.
- Research potential for FEMA map amendments.
- Seawall repairs.
- Public access improvements.
- Riparian habitat and fishery improvements.
- Improve fishing access.

Background Information

The “downtown” riverfront extends approximately 1.5 miles along the Grand River, between the North Lansing Dam and the Moore’s Park Dam. Some of the shoreline within this stretch of river has been hardened by construction of concrete retaining walls which impact aquatic habitat along the river edge. This stretch of river is relatively flat with low velocity and is directly impacted by the low oxygen levels and high temperature water coming from the power plant cooling tower at Moore’s Park. The sponsor is interested in river edge improvements that enhance the water quality and habitat of the Grand River while improving aesthetics and providing for continuous public access. The City has worked extensively to establish a public easement along the Grand River for the extension of the River Trail and provision of continuous public access. The City views the Grand River as one of its greatest resources and continues to work to connect the river to businesses, parks, and neighborhoods. The riverfront will continue to be a focus as several significant projects and parcels of land are being discussed for redevelopment and/or expansion. Significant projects being discussed include expansion of the Lansing Center, adaptive reuse of the former Ottawa Power Plant, potential development of the “Triangle” property near Davenport University, and modifications at Wentworth Park associated with a planned CSO elimination. The potential for these riverfront projects offers the opportunity to incorporate exciting public access improvements, restoration of the Grand River shoreline, habitat creation, flood protection and improved fishing access.

Concepts Reviewed With Stakeholders

In discussions with the MDNR a project was formulated to restore degraded river edge habitat in the downtown area, which included bio-engineered shoreline features and the removal of the North Lansing Dam. The MDNR expressed that additional benefits, besides the fishery, would occur from removal of the dam, including; restoration of the Grand River from a reservoir type habitat to more of a historically significant riverine habitat, improved sediment transport, greater opportunity for riparian zone restoration, improved river temperatures, and improved dissolved oxygen levels.

To illustrate potential ideas for bio-engineered river edge improvements that can incorporate public access, habitat creation, increased fishing opportunities and flood protection, conceptual renderings were presented to stakeholders at the Wentworth Park, Ottawa Plant and Adado Park areas. Stakeholders were generally enthusiastic about the proposed restoration concepts presented and agreed that further evaluation was needed to determine if project implementation would be feasible.

Outstanding Issues

In discussions with the MDNR, it was determined that habitat restoration along the Downtown river edge in combination with removal of the North Lansing Dam would derive sufficient aquatic habitat restoration benefits to justify a Corps of Engineers project. Such a project would be supported by the MDNR.

However, habitat restoration without dam removal in the immediate downtown area would be difficult to justify for Corps assistance due to the continued impact (low dissolved oxygen, high temperature, and slow moving water) on fishery and aquatic habitat from the North Lansing Dam and the Moore's Park Dam. Downtown Lansing is located along a 1.5 miles stretch of the Grand River between the 2 dams, with the North Lansing Dam on the downstream side and Moore's Park on the upstream side.

Project Benefits

As discussed previously, benefits of river edge improvements can include increased habitat, water quality improvements, improved public access, fishing opportunities, aesthetic values, and the ability to bring people, businesses and wildlife to the river.

Preliminary Reconnaissance Cost Estimates

Table 4: Preliminary Construction Cost Estimates	
Construction Task	Construction Cost
Terraced River Edge	\$4,800,000
Waterfront Green	\$320,000
Oxbow / Marsh	\$50,000
River Trail (est. 3000 ft of asphalt)	\$100,000
CONSTRUCTION SUBTOTAL	\$5,270,000
Contingency (15%)	\$790,500
TOTAL ESTIMATED CONSTRUCTION COST	\$6,060,500

4) North Lansing Dam Modification for Habitat, Fishery and Water Quality Improvements:

Problems

- Limited fish habitat.
- Restricted/Unnatural fish mobility.
- Water quality.
- Impeded boat access.
- Scour.

Potential Solutions

- Remove or modify portion of dam to permit fish and boat passage.
- Artificial rapids.

Background Information

The North Lansing Dam was designed and constructed in 1936 by the Lansing Board of Water and Light (LBWL). It is located on the Grand River in north central Lansing. East Burchard Park and West Burchard Park, and the Brenke Fish Ladder (1981), owned by the City of Lansing, border the dam. The purpose of the dam was to provide a pond for the LBWL's soon to be constructed Ottawa Street Power Station, and secondarily to provide hydropower. The North Lansing Dam replaced a rock filled timber crib dam originally constructed in 1838. The North Lansing Dam is located just upstream of the original dam. The original dam was demolished in 1936 as part of the new dam construction project.

Existing Condition

The dam consists of a gated section 233'-4" long containing 4 drum gates, each 54'-4" long by 4-feet high when fully raised. Gate #1 can be operated independently of the other gates. Gates #2, #3, and #4 are on a common control system and all are operated together. A drum gate control chamber 11'-6" wide is just east of the gated section. A powerhouse 22-feet wide is just east of the gate control chamber. Overall dam length is approximately 267-feet 10 inches. Both river banks are lined with vertical concrete retaining walls that run on the right bank from about 66 feet upstream of the center of the powerhouse to about 217-feet downstream of the center of the powerhouse and on the left bank from about 38-feet upstream of the center of the dam to about 213-feet downstream of the center of the dam. The dam is supported on 3 lines of steel sheet piling that extend from the bottom through about 5- to 10-feet of sand and clay soil to the sandstone base rock. The retaining walls are also supported on steel sheet piles that extend to bedrock.

Headwater is maintained at about elevation 817.5 feet, and tailwater is normally about elevation 809 feet to 810 feet. Top elevation of the retaining walls is 828 feet above the dam and 825 feet below the dam. The pond created by the dam has a surface area of about 100 acres and a pondage of about 500 acre-feet. Average river flow is about 844 cfs. The dam has a pivot at its crest, which allows four feet of control.

The Brenke fish ladder was constructed by the City of Lansing in 1981. It is located east of the powerhouse and connects to the river through openings in the retaining walls just above and below the powerhouse. Inverts of the openings are at elevation 803 downstream and 812 upstream. The fish ladder is not part of the dam and is not structurally connected to it. The MDNR has indicated the Brenke Fish Ladder is useful for migratory fish such as salmon and steelhead, however, resident fish have difficulty utilizing the fish ladder.

The Ottawa Street Power Station was officially shut down in 1992. The hydro generator unit was decommissioned on December 27, 1990. The hydro unit is still in place but has been made unusable in accordance with established FERC procedures.

The stretch of river in the vicinity of North Lansing Dam has problems with smell and unpleasant streambed exposure during the Summer months.

Concepts Reviewed With Stakeholders

Although the Brenke Fish Ladder was constructed in 1981, the North Lansing Dam acts as a fish deterrent, particularly to the resident fish population, and also prohibits contiguous access via boat along the Grand River. Modification or Removal of this dam would open up 1.5 miles of the Grand River all the way upstream to Moore's Dam and provide unimpeded access to the Red Cedar River and its tributaries. The potential exists to restore a potentially important urban fishery in the City of Lansing.

One concept considered proposed creating a "rapids-like" habitat by removing or modifying the dam. A system of rapids would increase oxygen levels and reduce unpleasant odors. This would create unique habitat and potential for plant and animal species complexity and diversity, including habitat available for obligate riffle, pool and run species. The habitat diversity would also translate into an increase in benthic invertebrate production. The restoration of full fish passage will also provide the additional fish hosts for reproduction. Utilization of the river by humans would also be expanded. This rapids-like environment could provide for a unique recreation opportunity for small watercraft users while providing needed scour protection on the downstream side of the dam.

Another concept proposed leaving the concrete portion of the dam as is and placing boulders and riprap downstream to control scouring and create terraced pools to enable fish to move upstream. Enlarging the intake to the fish ladder to handle the same volume of water as the first gate now handles would allow some level of flow control. Even with the floodgates down in a severe flood, the down stream and upstream levels are within inches of one another.

Outstanding Issues

The MDNR has indicated that the existing Brenke Fish ladder is useful for migratory fish (salmon and steelhead), however, resident fish have difficulty using the fish ladder. Although the dam no longer functions for utility purposes, the City of Lansing needs to maintain control of water levels because it influences levels of the Red Cedar River in the vicinity of the Urbandale neighborhood and the Potter Park Zoo.

The non-migratory nature of the resident fish in the Grand River may not realize substantial ecological benefits if up and downstream passage were provided.

In discussions with the MDNR a project was formulated to restore shoreline and river habitat in the downtown area, which included bio-engineered shoreline features and the removal of the North Lansing Dam. The City of Lansing has as a primary goal to construct a lock system at Moore's Park Dam to allow larger boats to access the Downtown riverfront. The MDNR Fisheries Division has indicated that the likely consequence of removing the North Lansing Dam would be to limit boat access to canoe, kayak and other shallow depth boats. The City of Lansing has expressed that it would not support a habitat restoration project if it resulted in lowering water levels to such an extent that motor boats or boats larger than canoes/kayak could not access the downtown Lansing riverfront. Although no hydraulic modeling analysis had been accomplished, it is anticipated that there will be a lowering of water levels in the river if the North Lansing Dam is removed. Therefore, hydraulic analysis is needed to determine the consequence of removing the North Lansing Dam on upstream water levels.

Project Benefits

Modifying or Removing the North Lansing Dam would assist in achieving environmental improvements by restoring at least partial natural flows, enhance migratory and resident fish mobility and improve healthy river habitat for fish and wildlife. Constructing artificial rapids below the North Lansing Dam will make available desirable fish habitat, species diversity as well as aeration benefits to enhance water quality. If the dam were modified/removed to allow small boat passage, then recreational boating activities would benefit and assist in riverfront revitalization efforts.

The MDNR has expressed that additional benefits, besides an improved fishery, would occur from removal of the North Lansing Dam, including: restoration of the Grand River from a reservoir type habitat to more of a historically significant riverine habitat, improved sediment transport, greater opportunity for riparian zone restoration, improved river temperature, and improved dissolved oxygen levels.

Preliminary Reconnaissance Cost Estimates

Table 5: Preliminary Construction Cost Estimates*	
Construction Task	Construction Cost
Partial Removal of Dam	\$30,000
Rapids-Like Habitat	\$25,000
Shoreline Restoration	\$30,000
CONSTRUCTION SUBTOTAL	\$85,000
Contingency (15%)	\$12,750
TOTAL ESTIMATED CONSTRUCTION COST	\$97,750

* Assumes demolition and restoration work can be completed from land.

5) Urbandale Flood Protection and Floodplain Restrictions:

Problems

- A 30 square block area, known as the Urbandale neighborhood, is in the 100-year floodplain and has been inundated by four (4) major floods over the last 100 years with the last severe flooding occurring in 1975 when 8 feet of water entered the neighborhood. (Flood crest of 832 feet).
- The City indicated that the major road bisecting this neighborhood must be raised 12-feet to get it out of the 100-year flood plain.

Potential Solutions

- Investigate potential for structural and non-structural flood damage reduction alternatives.

Background Information

Urbandale, is bounded by Fairview Ave on the west, Michigan Ave on the north, US-127 on the east and I-496 on the south. The Red Cedar River runs along the south side of the neighborhood's south border.

The construction of elevated freeways along Urbandale's south (I-496) and east (US-127) perimeters has created a dike around Urbandale, which obstructs the natural drainage back into the Red Cedar River. This area has experienced severe flooding due to low elevations, climate, and its proximity to the Red Cedar River. Four (4) substantial floods have occurred in the last 100 years, the last major flood occurred in 1975, which had a crest elevation of 832+- feet.

Although major changes (e.g., improvement in the pump stations, development of retention areas in Groesbeck, redirection of the flow of water from the higher elevations north of Urbandale through sewers isolated from the Urbandale system) have taken place in the area since the 1975 flood, the area is still vulnerable to flooding if floodwaters from the Red Cedar River exceed the level of Kalamazoo Street as it crosses under US-127. Although, the pump station changes have increased reliability of the system, the floodwater protections will be exceeded if floods exceed the 10-year floodplain boundary elevation of 829.5 ft. Urbandale suffers the greatest risk of flooding not because of inadequate pumps or pipes, but rather because of the very low elevations of the area.

Portions of Urbandale lie as much as seven (7) feet below the elevation of the bed of the Red Cedar river, which is just south of I-496. Ground elevations in the study area range from a high of 844.7 feet at the block bounded by South Mifflin Avenue, Marcus Street, Francis Avenue, and East Kalamazoo Street to a low of 821.3 feet at the southern edge of South Foster Avenue. Lansing's Combined Sewer Overflow (CSO) Control Project has changed how water flows into the neighborhood. During the 1975 flood there was a failure of pumps, which moved storm water from storm drains to the Red Cedar. A new pump station (Harton Street Storm Water Pump Station) now utilizes gate valves to help protect the neighborhood from river water backing up thru the storm sewers during extreme events. The Urbandale neighborhood will be protected from flooding until the floodwaters rise to an elevation of approximately 829 feet. This represents about a 10-year flood event. At this elevation, the river will flow into the Urbandale area at the Kalamazoo Street and Michigan Avenue underpasses to US-127.

In 1979 the City of Lansing evaluated a plan to lessen damages from the 1975 flood. This plan recommended the acquisition and removal of all structures and parcels where flooding occurred to a depth of 5 feet or more in the southern portion of Urbandale. The plan proposed to clear this area of housing and construct a retention basin. The recommended acquisition included 171 residential structures, a light industrial structure, and 92 vacant parcels. This plan was never implemented.

The City of Lansing evaluated the possibility of constructing levees at Kalamazoo Street and Michigan Avenue. Although creation of the levees meets the criteria for remapping under the FEMA guidelines, it would require that Kalamazoo Street be raised above the levels of the 100-year floodplain (a 12.6 ft raise). The Study concluded that this construction would not be feasible, given that the portions of Kalamazoo St. needing to be raised are in the floodway of the Red Cedar River. Hence, construction would violate the Federal, State and local regulations about building in floodways.

Another alternative considered by the City of Lansing was to construct sandbag dikes, earthen levees, or inflatable barriers at Michigan Avenue and Kalamazoo Street to prevent the river from flowing into the Urbandale neighborhood. It was determined that sand bags are only reliable to a 3-foot height and would not be effective at Kalamazoo Street. Temporary earthen levees were considered, however, they need to be built 2 feet higher than flood depths and could not be relied on to hold back more than 6 feet of floodwater. Once again it was determined this alternative would not be effective at Kalamazoo Street and levees would be expensive and labor intensive.

During a May 2003 meeting the Sheriffs Department indicated its hope to use a portion of a Federal Project Impact Grant to install river gauges to watch and research water levels to better predict when flooding will occur.

Current Analysis

During June 2004, the Detroit District, Corps of Engineers completed a preliminary assessment of the Urbandale area to determine the feasibility of flood damage reduction alternatives within the affected area. This was not a detailed analysis but incorporates principles enunciated in U.S. Army Corps of Engineers guidance for urban flood damage evaluation. Benefits from plans to reduce flood hazards accrue primarily through the reduction in actual or potential damages associated with land use. Flood damages are physical damages or losses, income losses and emergency costs. If the floodplain use is the same with and without the plan, the benefit is the increased net income generated by that use. Information presented in the City of Lansing's Planning Department report, entitled: Urbandale Study, dated September 1979, indicated that 52.1 percent of the homes were rented. It is the consensus of the product delivery team that with or without a flood reduction project Urbandale would remain a residential area. Income benefits therefore would not be increased or current rentals enhanced due to a flood reduction project. The September 1979 report also stated that there were 461 housing units within Urbandale with 95.4 percent being single-family detached units. The area was toured and 461 units were deemed to still be a reasonable estimate.

Based on a residential value of \$120,000 and a 25% damage assessment, the expected value of losses is estimated at \$2,300,000 for a 50-year project life discounted at 5 5/8%, or an annualized benefit of \$138,300 if a flood damage reduction project could be constructed. Therefore the with-project condition would have to equate to an annualized cost of less than \$138,000 of benefits to be a viable project, a figure deemed unrealistic for a flood control project. The September 1979 costs for acquisition, relocation, closing, and demolition of the 171 homes was inflated to 2004 price levels and the Benefit-to-Cost ratio was calculated to be 0.16.

6) Environmental Infrastructure in Accordance with Long-Term CSO Control

Problems

- In 1991, the City of Lansing completed a Combined Sewer Overflow Control Project Plan to provide an approvable program as required in their NPDES permit. The recommended CSO control plan was for complete separation of the system with a 1991 estimated cost of \$176M. The construction of the project was scheduled over a period of approximately 30 years. The plan is prioritized based on mitigation of basement flooding problems, potential for total body contact in receiving waters, and improved operability of the system.

Potential Solutions

- Complete separation of the system by 2020

Background Information

As is documented in the City of Lansing Combined Sewer Overflow Control Project Plan (March 1991), the Grand River drains approximately 396 square miles and has an average flow of 829 cfs at Lansing. In 1991, the Lansing wastewater collection system had a total service area of 27,105 acres. As a result of construction done in the period from 1984 to 1989, approximately 6,700 acres are served by combined sewers and 18,100 acres served by separate sewers. Thus, an effective separation of over 38% had been achieved.

In 1991, there were 40 active overflows discharging untreated sewage directly or indirectly to the Grand and Red Cedar Rivers during most storm events, and there was a total combined sewer area of 6,487 acres. It was estimated that an average of 40 to 50 overflows of combined sewage were occurring annually. The combined sewer overflows significantly affect the levels of fecal coliform and dissolved oxygen in the river.

Lansing's Combined Sewer Overflow Control Project involves separating 203 miles of combined sewer pipes by constructing a second parallel pipe so raw sewage and stormwater are carried separately. The raw sewage will only go to the City's wastewater treatment plant and the stormwater will be discharged directly to the rivers.

Current Status of CSO Control Plan

Since 1991, 2,681 acres of combined sewer area have been separated (41%), 443 acres of additional separated area has been removed from contribution to the combined area. There are also 80 acres of combined sewer area currently under construction and 719 acres currently under design. The long-term CSO control plan calls for 4 pump stations and 2 sanitary equalization basins. The 4 pump stations have been constructed and are operational as is 1 sanitary equalization basin. Prior to the CSO project beginning, estimated annual overflows were 1.65 billion gallons. At the end of 2003, it was estimated that approximately 561 million gallons of annual overflow have been removed and 12 CSO regulator and overflow structures have been abandoned.

Outstanding Issues

Corps of Engineers is not authorized to participate in a local service facility construction for municipal stormwater and sanitary treatment.

Project Benefits

Benefits of the CSO Control/Sewer Separation program include:

- Cleaner rivers
 - Public health protection.
 - Aquatic habitat improvement.
 - Recreational opportunities.
 - Increased property values.
- Basement flooding mitigation.
- Improved reliability / capacity of new Lansing Avenue Pump Station.
- More efficient and reliable Wastewater Treatment Plant Operation.
- Improved sewage collection and transportation system.
- Cost-effective and reliable sewer system maintenance.
- Infrastructure enhancements at same time as separation.
 - Road improvements.
 - Utility upgrades.
 - Tree preservation.
- Meets MDEQ/USEPA Requirements.

Preliminary Cost Estimates

The City of Lansing estimates that the remaining project cost is expected to be over \$300 million (in future dollars at time of construction) and is scheduled for completion by 2020.

6. FEDERAL INTEREST:

Funding was received from Congress and directive language in FY 2003 for preparation of a master plan to identify and develop measures for flood control, shoreline protection, environmental restoration and protection, recreation and associated purposes at and in the vicinity of Lansing, Michigan. Only a Pre-Planning Master Plan Report, dated August 2004, has been prepared in conjunction with preparation of the Section 905(b) Analysis due to a lack of a clear determination and consensus as to the path ahead. Development of a detailed Master Plan would require more time and funds than the Section 905(b) process allows. There is a Federal interest to evaluate projects for flood control, shoreline protection and environmental restoration, therefore, it is recommended that development of the Grand River at Lansing, Michigan Master Plan continue into a more detailed phase.

A long range plan for development of shoreline protection, flood control, ecosystem restoration and protection, and recreation along the Grand River in Lansing, Michigan could be prepared which provides information and addresses problems which go beyond where typical Corps authorities would allow.

Further evaluation of the identified problems and opportunities and outstanding issues is needed in order to develop the costs and benefits for shoreline protection, environmental restoration and protection, and recreation within the study area.

In the next phase of Master Plan development, a more detailed evaluation of the flooding problems could be accomplished utilizing collected field data and design information. This would allow for a more complete determination of benefits to derived from structural and non-structure alternatives.

7. PRELIMINARY FINANCIAL ANALYSIS:

As the local sponsor, the City of Lansing, Michigan, will be required to provide 50 percent of the cost of the next phase of Master Plan development. The local sponsor is aware of the cost sharing requirements for further study. A letter of interest, dated 9 August 2004, from the local sponsor stating a willingness to pursue the next phase of Master Plan development and to share in its cost is included as Attachment 1.

8. ASSUMPTIONS AND EXCEPTIONS:

a. Feasibility Phase Assumptions:

None.

b. Streamlining Initiatives:

1) The study would be conducted in accordance with the Principles and Guidelines and the Corps of Engineers regulations.

c. Quality Objectives:

1) Information developed would be adequate for the local sponsor to make appropriate water resource planning decisions.

9. MASTER PLAN MILESTONES:

Description	Duration (month)	Cumulative (month)
Master Plan	0	-----
Initiate Master Plan	2	2
Field Data Collection, Hydraulic Modeling, and Sediment Collection/Testing	6	During 1 st 6 months of study
Public Workshop/Scoping	1	3
Alternative Formulation	4	7
Draft Master Plan	3	10
Public Workshop/Review Draft Master Plan	1	11
Incorporate Comments into Draft Master Plan	2	13
Final Master Plan	3	16
Final Public Meeting	2	18

10. MASTER PLAN COST ESTIMATE:

The **General Scope** of the Master Plan would include:

- Map Study Area.
- Prepare a baseline environmental assessment.
- Identify funding sources.
- Establish a committee of stakeholders.
- Define property ownership along study area.
- Develop schematic concept master plan alternatives with costs.
- Phase 1 HTRW investigation.
- Hold public meetings to present progress and solicit input and feed back.
- Initiate local, state, and federal agency coordination.
- Prepare Draft and Final Master Plan Reports.
- Planning and design team review past reports and studies.
- Coordinate public information workshops for community and neighborhood participation.

Specific Tasks for Master Plan development at individual sites would include:

Moore's Park

- Evaluation of target fish species.
- Site-specific baseflow hydrology and hydraulic.
- Determine long term impacts of elevated water temperature.
- Topographic Survey.
- Determine desire by MDNR to allow passage for migratory fish
- Evaluate natural approaches for exploring the nested channel and grade control approaches, riffle grade control structures, and specifically designed flow constrictor/step pool systems.
- Coordination with local, State, and Federal agencies including: MDNR, MDNR, USF&WS, and Federal Energy Regulatory Commission (FERC).

Potter Park Zoo:

- Determine layout and condition of sewer system.
- Stormwater runoff sampling.
- Determine which outdoor exhibits require treatment of runoff.
- Develop sampling program to demonstrate extent of water quality issues.

North Lansing Dam and Downtown Lansing

- Hydraulic modeling for removal of dam on all upstream areas including Downtown Lansing, Potter Park, Urbandale, Moore's Park.
- Sediment sampling.
- Ecological impacts of dam removal.
- Develop options for bio-engineered seawalls.
- Complete engineering evaluation for removal or modifying seawalls with respect to flooding, geo-technical load, contaminated sediments, and utilities.

The cost of the Master Plan is estimated to be: \$ 450,000

If a Master Plan were to be funded, then its costs would be 50 percent Federal and 50 percent non-Federal. The non-Federal share would be \$ 225,000, which can be provided in cash or Work-In-Kind. Up to 100 percent of the non-Federal share can be provided as Work-In-Kind. Prior to initiation of a Master Plan, a Project Management Plan (PMP) would be prepared at Federal expense to outline in detail the required tasks and associated costs needed to complete the report. The Project Management Plan will also identify the Work-In-Kind tasks to credit to the non-Federal sponsors share of study costs. The Project Management Plan will become the basis for the formal cost sharing agreement between the Federal government and the non-Federal sponsor.

In the event that projects are identified during preparation of the detailed Master Plan that appear to have Federal interest and local sponsorship, then there would be additional expenses for National Environmental Protection Act (NEPA) documentation, a Real Estate Plan, and more detailed Design and Economic Analysis. The PMP would likely be prepared to include decision points and phased work, which would initiate if a specific project with Federal interest and local sponsorship was identified, otherwise a Detailed Master Plan will be developed to reflect the goals and objectives of the local community.

11. REAL ESTATE:

The 905(b) Reconnaissance Report for Grand River in Lansing, Michigan will be used to determine whether or not to do a master plan, this does not require Real Estate input. A Real Estate professional will, however, remain on the Product Delivery Team to review, advise, appraise, and assist on Real Estate issues.

12. VIEWS OF OTHER RESOURCE AGENCIES:

The Michigan Department of Natural Resources (MDNR) and Michigan Department of Environmental Quality (MDEQ) attended the stakeholder meetings and participated in development of the reconnaissance report. The MDNR expressed interest and support of a project to remove the North Lansing Dam as a broad based effort for habitat restoration along the Grand River.

13. RECOMMENDATIONS:

Funding was received from Congress in FY 2003 with directive language for preparation of a master plan to identify and develop measures for flood control, shoreline protection, environmental restoration and protection, recreation and associated purposes at and in the vicinity of Lansing, Michigan. There is a Federal interest to evaluate projects in the Corps mission areas of flood control, shoreline protection, environmental restoration and protection, and recreation. However, further public, private and local government coordination is needed to establish a central common vision for the City of Lansing riverfront along the Grand River, and in turn to identify the Federal interest in implementing that vision. Until such time as a consensus vision is developed, a Federal interest is defined and a local sponsor is identified as willing to participate in a cost shared feasibility study for those projects within Corps mission areas, it is recommended that development of a Master Plan for the Grand River at Lansing, Michigan continue under the existing study resolution authority. Cost sharing for a Master Plan would be as directed by Congress.

A Detailed Master Plan would include an analysis of land use and ownership along the river corridors (Grand and Red Cedar); public coordination of goals, objectives, and alternatives; concept design and collection of design data including topographic maps, soils and sediment information, hydraulic modeling, and aerial photography; identification of high priority bank stabilization areas; development of concepts for continuation of the River Trail, recreational uses, and provision of public access; and finally the development of water quality, flood damage reduction, and habitat restoration and protection measures.

23 Dec 04

Date



Donald P. Lauzon
Lieutenant Colonel, U.S. Army
District Engineer